We claim:

1. An aviation navigation system comprising:

a global positioning system (GPS) receiver configured to produce GPS signals representative of a geographic location of an aircraft;

an inertial navigation system (INS) which is configured to monitor acceleration and rotational rate of an aircraft and generate INS signals representative of position, velocity and attitude of said aircraft;

an integration processor, coupled to said GPS receiver and INS, said integration processor configured to receive said GPS signals and said INS signals and generate a corrected position of said aircraft in response thereto;

said integration processor computes a multitude of navigation solutions based on different fault hypotheses; and

said integration processor further comprising a fault detection function and a fault exclusion function; and

wherein said fault exclusion function is separate and distinct from said fault detection function.

2. A system of claim 1 wherein said fault exclusion function is configured to exclude a fault before said fault detection function detects said fault.

3. A system of claim 1 wherein said fault detection function and said fault exclusion function operate in parallel.

4. A system of claim 2 wherein said fault exclusion function does not include as an input a fault detection from said fault detection function.

5. A system of claim 2 wherein said fault detection function is based on a normalized solution separation scheme and said fault exclusion function utilizes a measurement residual technique.

6. A system of claim 1 wherein said fault detection function further comprises:

an input from a full filter, which process a plurality of available measurements; and,

an input from a plurality of sub-filters where each of said plurality of sub-filters excludes a different one of said plurality of available measurements.

7. A system of claim 6 wherein said fault detection function provides a signal representative of a horizontal protection level (HPL) and a horizontal uncertainty level (HUL) and wherein said system is an open loop system without feedback to said GPS receiver and said INS.

8. A system of claim 1 wherein said fault exclusion function further comprises:

an input from said plurality of sub-filters where each of said plurality of sub-filters excludes a different one of said plurality of available measurements; and,

an input from a least squares solution function which utilizes all of said plurality of available measurements.

9. A system of claim 5 wherein said normalized solution separation scheme determines a covariance of the solution separation vector, $\boldsymbol{B}_j(k)$, where

$\boldsymbol{B}_j(k) = \boldsymbol{P}_j^h(k/k) - \boldsymbol{P}_0^h(k/k)$ with $\boldsymbol{P}_j^h(k/k) = E\left\{\tilde{\boldsymbol{x}}_j^h\left(\tilde{\boldsymbol{x}}_j^h\right)^T\right\}$ and $\boldsymbol{P}_0^h(k/k) = E\left\{\tilde{\boldsymbol{x}}_0^h\left(\tilde{\boldsymbol{x}}_0^h\right)^T\right\}$.

10. A system of claim 8 wherein said fault exclusion function issues a re-initialization signal.

11. A navigation system comprising:

means for determining a geographic location of an object in response received satellite signals;

means for monitoring acceleration and rotational rate of said object;

means for integrating outputs from said means for determining and said means for monitoring; and

wherein said means for integrating comprises a means for fault detection and a means for fault exclusion which function independently and are based on a multitude of navigation solutions.

12. A system of claim 11 wherein said means for fault exclusion further comprises means for post update residual monitoring and means for determining a least square solution of a plurality of available measurements.

13. A system of claim 11 wherein said means for fault detection uses a normalized approach to determine statistical properties of a test statistic.

14. A system of claim 11 wherein said means for fault detection generates a horizontal protection level and a horizontal uncertainty level.

15. A method of improving integrity of position information of a navigation system comprising the steps of:

determining a plurality of locations of a moving object using signals from a plurality of global positioning system satellites;

monitoring acceleration and attitude characteristics of said object using an inertial sensor;

detecting faults in said plurality of locations, by using a detection test statistic in a first domain;

excluding faults from said plurality of locations, by using an exclusion test statistic in a second domain; and

wherein said first domain and said second domain are different.

16. A method of claim 15 wherein said first domain is position and said second domain is range.

17. A method of claim 16 wherein said step of detecting further comprises generating a horizontal protection level signal, a horizontal uncertainty level signal and covariance of solution separation vector computed as $\boldsymbol{B}_j(k) = \boldsymbol{P}_j^h(k/k) - \boldsymbol{P}_0^h(k/k)$ with $\boldsymbol{P}_j^h(k/k) = E\left\{\tilde{\boldsymbol{x}}_j^h\left(\tilde{\boldsymbol{x}}_j^h\right)^T\right\}$ and $\boldsymbol{P}_0^h(k/k) = E\left\{\tilde{\boldsymbol{x}}_0^h\left(\tilde{\boldsymbol{x}}_0^h\right)^T\right\}$.

18. A method of claim 17 wherein said step of excluding faults further comprises the steps of performing a post update residual monitoring and a determining a least squares solution.

19. A method of claim 18 wherein said steps of performing a post update residual monitoring and determining a least squares solution are done in parallel.

20. A method of claim 19 wherein said step of detecting faults and said step of excluding faults are done in a parallel and independently.